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A RESUME OF THE PRESENT STATE OF OUR KNOWLEDGE OF SCARLET FEVER

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DEFINITIONS: Scarlatina or Scarlet Fever is an acute, infectious, and highly contagious fever of unknown origin conferring immunity and characterized by sudden onset and the prompt appearance, (second day), of a bright scarlet, punctiform eruption terminating in desquamation, the disease showing a marked tendency to inflammatory involvement of the kidney, middle ear, throat, and cervical glands.

The incubation period is short, rarely over seven days, and excepting during epidemics, the disease is almost entirely confined to children.

Etiology: It must be admitted that, in spite of the numerous and varied investigations directed toward the discovery and isolation of the etiologic agent, the cause of Scarlet Fever is still unknown. The most recent experiments, (September, 1921), made upon human volunteers who had never had the disease and who were, therefore, presumably immune, in which blood, blood serum, filtrates of secretions from the nose and throat, and cultures of hemolytic streptococci isolated from fatal scarlet fever cases were injected subcutaneously, failed to produce a single instance of typical scarlet fever.

There are several ways of accounting for the failure thus far to discover the cause of this disease:

1. The organism may be ultramicroscopic—that is, too small to be seen

with the microscopic powers now available.

2. Culture media and methods suitable for its growth may not have been found.

3. The causative agent may belong to those grouped under the heading of “filterable viruses,” signifying that they are of such a character as to pass through a filter capable of holding back the smallest known bacterium.

4. The organism may be resistant to all the staining methods now in use and so, while present, not seen under the microscope.

5. The methods of inoculation may not be suitable for the production of the disease experimentally.

6. Animals susceptible to the disease are not available for laboratory study.

As is well known, before any organism can be accepted as the definite cause of a definite disease, what are known as “Koch’s postulates” must be fulfilled. These are:

1. The organism must be constantly found in the lesions of the disease, and isolated from them in pure culture.

2. When injected into a *susceptible* animal the disease must be produced.

3. The same organism must be recovered in pure culture from the animal in which the disease was experimentally produced.

Animals usually utilizable for experi-

mental work are not susceptible to scarlet fever with the possible exception of the higher apes closely related to man and even in these the disease has not been exactly reproduced. This immunity in animals is not easily explained. The condition is illustrative of the fact that, for reasons not always clear, there are certain pathological conditions to which man is subject and animals are not, and vice versa. Of course, the animals available for laboratory use are comparatively few in species and a susceptible animal may yet be found.

Transmission: The exact mode of transmission of scarlet fever is more or less a matter of guess work and tradition, but the infection has been transmitted in one known instance by the subcutaneous inoculation of pharyngeal mucus; and its transmission through the agency of the nasal and pharyngeal secretions and the desquamated scales from the skin is generally recognized.

The causative agent seems to live a long time and to be very resistant to the effects of drying, etc., and clings to clothing, and articles handled by the patient, which explains the occurrence of the disease through clothes, toys, etc., long stored away in trunks.

Pathology: There are, apparently, no specific organic changes due to the virus itself; when found they are generally the effect of secondary streptococcic infections. The lesions in the throat, in which streptococci are predominant, are apt to be very destructive in character and the same may be said of the secondary involvement of the middle ear and cervical glands.

The most important and constant complication, and one directly respons-

ible for much of the mortality, is the frequent accompanying nephritis. This occurs either as an acute interstitial or an acute glomerulonephritis and may result in severe disturbance of renal function even to complete anuria with subsequent permanent functional disability. Though an after chronic nephritis is frequent it is by no means inevitable, and may often be averted by scrupulous care and nursing—a fact not to be forgotten.

Relation of Streptococci to Scarlet Fever: The extraordinary frequency with which streptococci are found as secondary invaders constitutes so marked a feature of this disease as to have led to numerous efforts to establish them, either as a group, or as a separate and distinct strain, as the cause, but adequate evidence has not been produced and there is much opposed to this view.

Occasionally, in severe streptococcic septicemias, a rash somewhat resembling that of scarlatina has been noted, but this is so infrequent as to cause no confusion between the two diseases. In the streptococcic infections the rash, when seen, is due to the hemolytic action of the streptococcus which gives rise to numerous, minute spots of color due to the destruction of red blood cells by the streptococcic toxin and consequent hemorrhages and liberation of hemoglobin into the skin.

The true scarlet fever rash is readily distinguishable, being distinctive in color, character, and distribution. It is a bright scarlet, "lobster-colored" rash of *punctiform* character most marked on the inner surface of the thighs and the flexor surfaces of joints, and *apt to be paler or absent around the mouth*. Such

a rash in the presence of an acute onset with fever, sore throat, and vomiting is sufficient to make the diagnosis.

Rare cases occur in which the rash is absent, in which case it may be provoked by a hot bath or pack.

Specific Treatment: There is no specific treatment of this disease such as obtains for diphtheria and tetanus.

Because of the association of streptococci with this disease, streptococcic vaccines and antistreptococcic serums have been used with results which may be thus briefly summed up:

Vaccines: As preventives their value has not been definitely established and their use in this connection is entirely experimental.

As a means of treatment, streptococcus vaccines have some value. They have absolutely no effect upon the course of scarlatina *per se* and do not at all influence the course of the disease; they do, however, because of the production of antibodies against the streptococcus, to some extent modify the occurrence and severity of the streptococcic complications so frequently seen, and for this purpose their use is justified.

Antistreptococcic Serum: Serums made by immunizing horses with *living* cultures of streptococci from the heart blood of fatal cases of scarlet fever have, on the whole, given fairly good results in the treatment of the disease. Cases overwhelmed at the onset, presumably by the true scarlet fever virus, are unaffected; those most likely to benefit are the cases which become severely ill *after* the appearance of the eruption or those, in other words, in

which the effects of secondary streptococci infection are most marked.

Immune Serum: The treatment of scarlet fever by the injection of serum from patients convalescing from the disease was first attempted in 1897 and has since been used by various observers with varying results. While the results obtained have not been brilliantly or definitely successful, it would appear that the method is worthy of extended trial, certainly in the severe, toxic cases not likely to respond to other methods of treatment. In the absence of immune serum, even normal serum may be used, as there are some observations which seem to indicate that normal serum may be beneficial.

In the ultimate analysis it must be admitted that we are still groping in the dark and that the cause of scarlet fever and exact knowledge as to the prevention and specific treatment of the disease still remains to be discovered.

The best weapons now at our disposal in the prophylaxis of this disease and of the complications responsible for much of the mortality and functional disability consequent upon this infection are embodied in careful, constant, and conscientious nursing.

The report of the U. S. Public Health Service for August 18 contains an exceedingly valuable article on Diphtheria by J. W. Schereschewsky, Assistant Surgeon General. It is especially commended to those who are teaching in our schools or to those who are concerned with the problems of the public health field.

American Hospital Association Bulletin No. 44 gives the results of a searching questionnaire on Disinfection after Contagion.